AMENDMENTS TO THE CLAIMS

Please cancel claims 1-147, without prejudice or disclaimer and add the following NEW claims:

148. (New) A method of producing a fine particle material comprising:

- introducing one or more substances contained, such as dissolved and/or dispersed in one or more fluid(s) into a vessel by introducing said fluid(s) into the vessel, said vessel containing one or more section(s) comprising a material, at least one of the fluids being in a supercritical state before or after being introduced into said vessel,
- causing and/or allowing, said substances to precipitate at least partly as primary particles on the surface of said material,

wherein at least one of said substances undergoes a chemical reaction,
wherein at least one said substances undergoing a chemical reaction is an alkoxide, and
wherein said alkoxide comprises a metal- or semi-metal alkoxide,
wherein the method further comprises:

introducing into the vessel at least one of reactant(s) and/or precursor(s) and/or initiator(s) and/or catalyst(s) for said chemical reaction; and
subsequently introducing into the vessel said one or more substances dissolved and/or dispersed in at least one fluid.

149. (New) The method according to claim 148, wherein said chemical reaction(s) is/are a sol-gel reaction(s).

150. (New) The method according to claim 148, wherein the average diameter of said nanoscaled primary particles is smaller than 100 nanometer such as smaller than 30 nanometer, preferably smaller than 20 nanometer, and even more preferable below 15 nanometer such as below 10 nanometer.

151. (New) The method according to claim 148, wherein the standard deviation of the size distribution of said primary particles formed is less than 60 % of the average diameter of said primary particles, such as 40 % of the average diameter of said primary particles, and preferable

less than 30 % of the average size of said primary particles, and even more preferable less than 20 % of the average size of said primary particles such as less than 15 % of the average size of said primary particles.

152. (New) The method according to claim 148, wherein the standard deviation of the size distribution of said primary particles formed is maximum 20 nanometer, such as maximum 10 nanometer, and preferably less than 5 nanometer, and even more preferably less than 3 nanometer.

153. (New) The method according to claim 148, wherein at least one of said fluid(s) being in a supercritical state is selected from the group consisting of carbon dioxide, alcohols such as methanol, ethanol, propanol, isopropanol, buthanol, isobuthanol, pentanol, hexanol, water, methane, ethane, propane, buthane, pentane, hexane, cyclohexane, heptane, ammonia, sulfurhexafluoride, nitrous oxide, chlorotrifluoromethane, monofluoromethane, acetone, THF, acetic acid, citric acid, ethylene glycol, polyethylene glycol, N,N-dimethylaniline and mixtures thereof

154. (New) The method according to claim 148, wherein the pressure of at least one of said fluids is in the range 85-500 bar, preferably in the range 85-500 bar, such as in the range 100-300 bar.

155. (New) The method according to claim 148, wherein the temperature in the vessel is maintained in the range 20-500 °C, such as 30-450 °C, and preferable in the range 35-200 °C, and more preferable in the range 40-150 °C.

156. (New) The method according to claim 148, wherein said fluid further comprises at least one co-solvent.

157. (New) The method according to claim 148, wherein said precipitation is provided/caused by a change in the solubility of at least one of said substances is due to an antisolvent present in the vessel

158. (New) A method of producing a fine particle material comprising

- introducing one or more substances contained, such as dissolved and/or dispersed in one or more fluid(s) into a vessel by introducing said fluid(s) into the vessel, said vessel containing one or more section(s) comprising a material, at least one of the fluids being in a supercritical state before or after being introduced into said vessel,
- causing and/or allowing, said substances to precipitate at least partly as primary particles on the surface of said material,

wherein said precipitation is provided/caused by a change in the solubility of at least one of said substances, and wherein said antisolvent is one of the fluids being introduced to the vessel.

159. (New) A method of producing a fine particle material comprising

- introducing one or more substances contained, such as dissolved and/or dispersed in one or more fluid(s) into a vessel by introducing said fluid(s) into the vessel, said vessel containing one or more section(s) comprising a material, at least one of the fluids being in a supercritical state before or after being introduced into said vessel,
- causing and/or allowing, said substances to precipitate at least partly as primary particles on the surface of said material,

wherein said precipitation is provided/caused by a change in the solubility of at least one of said substances, and wherein said change in solubility of at least one of said substances is provided/caused by expanding at least one of said fluids containing at least one of said substances into the vessel.

160. (New) The method according to claim 158, wherein at least one of said substances undergoes a chemical reaction, and wherein said chemical reaction(s) is/are a sol gel reaction(s), and wherein the maximum temperature in the vessel during said sol-gel reaction(s) is maintained

below 400 C, such as below 300 C, preferably below 250 C such as below 200 C, and even more preferably below 150 C such as below 100 C.

161. (New) The method according to claim 160, wherein at least one of said substances undergoing a chemical reaction is an alkoxide, and wherein said alkoxide comprises a metal- or semi-metal alkoxide, comprising:

introducing into the vessel at least one of said reactant(s) and/or precursor(s) and/or initiator(s) and/or catalyst(s) for said chemical reaction; and

subsequently introducing into the vessel one or more substances dissolved and/or dispersed in at least one fluid.

162. (New) The method according to claim 160, wherein at least one of said substances undergoing a chemical reaction is an alkoxide, and wherein said alkoxide comprises a metal- or semi-metal alkoxide, comprising multiple subsequent steps of

introducing into the vessel at least one of said reactant(s) and/or precursor(s) and/or initiator(s) and/or catalyst(s) for said chemical reaction; and

subsequently introducing into the vessel one or more substances dissolved and/or dispersed in at least one fluid.

163. (New) The method according to claim 162, wherein said material in said one or more section(s) is capable of adsorbing at least one of said reactant(s) and/or precursor(s) and/or catalyst(s) on said material.

164. (New) The method according to claim 163, wherein said reactant(s) and/or precursor(s) and/or catalyst(s) is/are adsorbed substantially in a monolayer of said material.

165. (New) The method according to claim 164, wherein the time for said chemical reaction(s) is less than 24 hours, such as less than 12 hours and preferable less than 8 hours, and even more preferable less than 4 hours.

166. (New) The method according to claim 164, wherein the time for said chemical reaction(s) is maximum 2 hours, such as maximum 1 hour, preferably less than 30 minutes and even more preferably less than 15 minutes.

167. (New) The method according to claim 166, wherein said material present in said one or more section(s) of said vessel, comprises additional nucleation sites, and wherein said material present in said one or more section(s) of said vessel, provides a seeding effect, and wherein the number of nucleation sites is further increased by introducing an ultrasound and/or a vibrating surface effect, and wherein said material present in said one or more sections is a template for forming said primary particles into a specific shape, size, structure or phase.

168. (New) The method according to claim 167, wherein said primary particles being produced is a least partly crystalline.

169. (New) The method according to claim 166, wherein said material present in said one or more section(s) of said vessel, provides a distributing effect of said fluid(s) being introduced into said vessel, and wherein said material present in said one or more sections comprises a porous structure such as a sheet, a spongeous or a grid structure.

170. (New) The method according to claim 166, wherein said material present in said one or more section(s) of said vessel, provides a distributing effect of said fluid(s) being introduced into said vessel, and wherein said material present in said one or more sections is a fibrous material.

171. (New) The method according to claim 170, wherein said material present in said one or more sections has/have a hydrophilic surface.

172. (New) The method according to claim 171, wherein said material is a polymer material.

173. (New) The method according to claim 169, wherein said material is a ceramic material, and wherein said material is an aerogel.

174. (New) The method according to claim 173 comprising:

- producing said aerogel material by a sol-gel reaction in an organic solvent;
- removing said organic solvent by extraction in supercritical CO_2;
- drying at least partly said aerogel; and
- forming said primary particles on the surface of said aerogel by the method of claim 1.

175. (New) The method according to claim 174, wherein the specific surface area (m^2/m^3) of said material in said sections is above 500 m^2/m^3, such as 1000 m^2/m^3, such as above 10.000 m^2/m^3, and preferably above 50.000 m^2/m^3 such as above 100.000 m^2/m^3.

176. (New) The method according to claim 174, further comprising re-circulating at least part of a fluid mixture present in the vessel, wherein the re-circulating comprises:

- withdrawing from the vessel at least a part of a fluid from the vessel and feeding it to a re-circulation loop and subsequently feeding the fluid back to the vessel.

177. (New) The method according to claim 174, further comprising controlling the temperature of the fluid in the re-circulation loop.

178. (New) The method according to claim 177, wherein heat is added or extracted from the fluid in the re-circulation loop.

179. (New) The method according to claim 176, wherein one or more reactant is added or extracted from the fluid in the re-circulation loop.

180. (New) The method according to claim 176, wherein at least one of the reactants is an alcohol an alkoxide or water, and wherein a metal or semi-metal alkoxid is produced in situ in the process prior to being introduced to said vessel by said fluid.

181. (New) The method according to claim 180, wherein said material present in said one or more sections in vessel with said precipitated primary particles thereon comprises the final product.

182. (New) The method according to claim 181, wherein said product comprises primary particles deposited on a carrier film such as a tape cast.

183. (New) The method according to claim 181, wherein said primary particles on said surface of said material constitutes a film or a coating.

184. (New) The method according to claim 182, wherein said film or coating has one or more layer(s) each layer having a layer thickness of up to 1 micron, such as a layer thickness below 500 nanometer, preferable a layer thickness below 250 nanometer such as a layer thickness below 100 nanometer.

185. (New) The method according to claim 182, wherein said film or coating has one or more layer(s) having a layer thickness that is below 50 nanometer.

186. (New) The method according to claim 183, wherein said coating comprises multiple layers.

187. (New) The method according to claim 184, wherein the layers comprise different materials.

188. (New) The method according to claim 186, wherein said product is further subjected to an annealing process.

189. (New) The method according to claim 188, wherein said annealing process is performed by microwaves.

190. (New) The method according to claim 189, wherein said primary particles are deposited on the surface of said material in the form of individual particles or small clusters of individual particles.

191. (New) The method according to claim 189, wherein said small clusters comprise less than 10 atoms.

192. (New) The method according to claim 189, wherein said primary particles precipitated on said surface of the material present in said one or more section(s) are removed from said material as a powder.

193. (New) The method according to claim 192, wherein said powder has weakly bounded agglomerates of a size of maximum 10 micron, such as up to 5 micron, and preferably up to 1 micron such as up to 500 nanometer.

194. (New) The method according to claim 193, wherein said powder is removed from said material by introducing a vibrating effect and/or an acoustic effect such as ultrasound waves and/or by back flushing and/or by applying an pressure pulse effect.

195. (New) The method according to claim 193, wherein said fluid containing said formed powder is fed into a second vessel containing a liquid.

196. (New) The method according to claim 193, wherein said vibrating effect is generated by a magneto restrictive means, and whercin said removal of said powder is performed according to a back flush or back pulse or a back chock technique, and wherein said fluid containing said formed powder is expanded into said liquid thereby providing said formed powder material as a dispersion in said liquid.

197. (New) The method according to claim 193, wherein said vibrating effect is generated by a magneto restrictive means, and wherein said removal of said powder is performed according to a

back flush or back pulse or a back chock technique, and wherein said fluid containing said formed powder is fed to a bag filter or ceramic filter for separation of said formed powder material from the fluid.

198. (New) The method according to claim 193, wherein said vibrating effect is generated by a magneto restrictive means, and wherein said removal of said powder is performed according to a back flush or back pulse or a back chock technique, and wherein said fluid containing said formed particulate material is fed to a membrane separation device.

199. (New) The method according to claim 193, wherein said vibrating effect is generated by a magneto restrictive means, and wherein said removal of said powder is performed according to a back flush or back pulse or a back chock technique, and wherein said formed powder contained in said fluid is deposited on to a second solid in a second vessel.

200. (New) The method according to claim 199, wherein said primary particles comprise an electro-ceramic material.

201. (New) The method according to claim 199, wherein said primary particles comprise a semi-conducting material.

202. (New) The method according to claim 199, wherein said primary particles comprise a magnetic, ferromagnetic, paramagnetic, or superparamagnetic material.

203. (New) The method according to claim 199, wherein said primary particles comprises a core-shell structure.

204. (New) The method according to claim 199, wherein said core comprises a magnetic or ferro magnetic core.

205. (New) The method according to claim 199, wherein said primary particles comprise a piezoelectrical material.

206. (New) The method according to claim 205, wherein said piezoelectrical material comprises lead zirconate titanate, Pb $(Zr_{0,52},Ti_{0,48})0_3$.

207. (New) The method according to claim 199, wherein said primary particles comprises oxide(s), oxyhydroxide(s), hydroxide(s) such as metal oxide(s), semi-metal oxide(s), metal oxyhydroxide(s), semi-metal oxyhydroxide(s), metal hydroxide(s), semi-metal hydroxides and combinations thereof.

208. (New) The method according to claim 207, wherein said oxides comprise oxides of one or more of the following elements: Al, Si, Ti, Zr, Zn, Fe, Ni, Co, Ce, Ge, Ba, Sr, W, La, Ta, Y, Mn, V, Bi, Sn, Te, Se, Ga, Be, Pb, Cr, Mg, Ca, Li, Ag, Au, Pt, Pd, Cd, Mo, or Eu and combinations thereof.

209. (New) The method according to claim 207, wherein said oxides are silica, aluminia, zirconia, or titania and combinations thereof.

210. (New) The method according to claim 207, wherein said primary particles comprise carbide(s) or nitride(s).

211. (New) The method according to any claim 207, wherein said metal or semi-oxide(s) is/are precursor(s) for a thermoclectric material.

212. (New) The method according to claim 207, wherein said primary particles deposited on the surface of said surface provide an antibacterial surface.

213. (New) An apparatus comprising the product made by the method of claim 212.

214. (New) A product obtained by the method of claim 148.

215. (New) A composition comprising a hard nanocrystalline coating that comprises primary particles of Al_2O_3 and ZrO_2 according to claim 207, wherein said coating has a hardness of at least 10 GPA.

216. (New) A composition comprising a hard nanocrystalline coating that comprises primary particles of Al_2O_3 and ZrO_2 according to claim 207, wherein said coating has a scratch and wear resistance of at least 30 N.

217. (New) A composition comprising a hard nanocrystalline coating according to claim 215, further comprising primary particles of ZnO.

218. (New) A hard nanocrystalline coating according to claim 216, wherein said coating is applied to a polymer or a glass material.

219. (New) A mechanical part with a hard nanocrystalline coating according to claim 218, wherein said coating is applied to the surface of said mechanical part.